VERIFICATION BULLETIN

MAY - JUNE - JULY 2021

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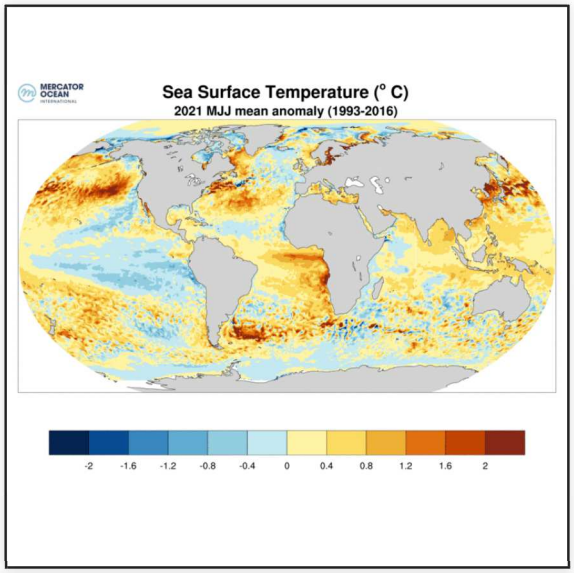
Introduction : Objective

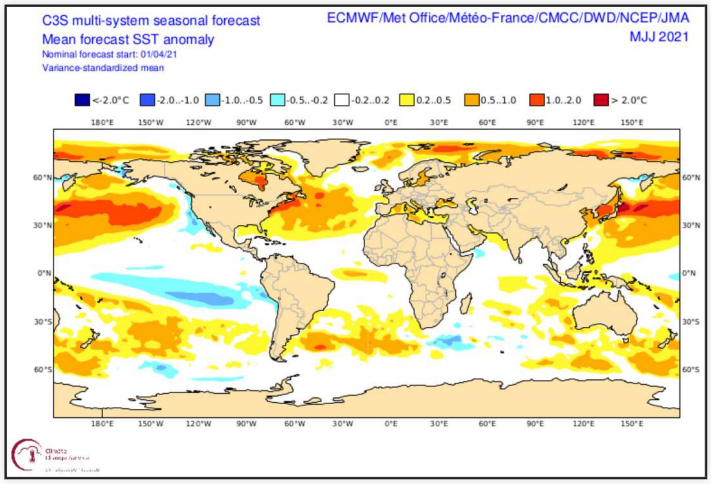
- **The objective of the Seasonal Verification Bulletin is to present an evaluation of the main elements highlighted in the Seasonal Forecast Bulletin : oceanic forcings, large scale circulation patterns, and a focus on temperature and precipitation forecast over Northern Atlantic, Europe and the Mediterranean Basin.**
- **The aim is not to evaluate the mean skill of Seasonal Forecast models, for which scores are calculated over the whole hindcast period, but to enhance the knowledge of the behavior of models for advanced users (as National Meteorological Services), in parallel with an assessment of expertised forecast. This approach meets the need of many users, who want to know the recent real-time performances of forecasts, for specific events.**
- **Thanks to Mercator-Ocean and DWD (RCC-Climate Monitoring node for Europe) for providing products and analysis on the monitoring part.**

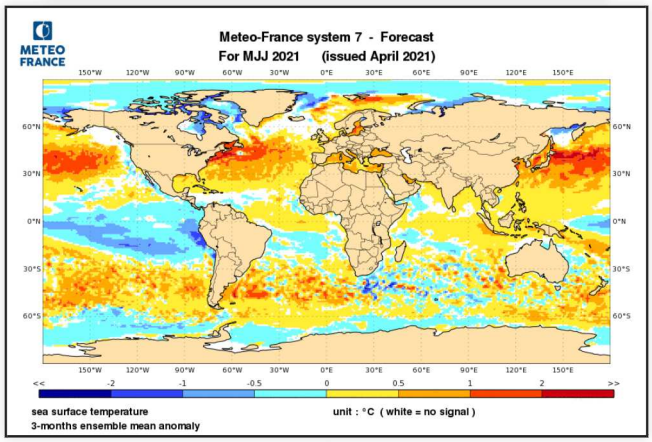
Oceans : surface temperature anomalies

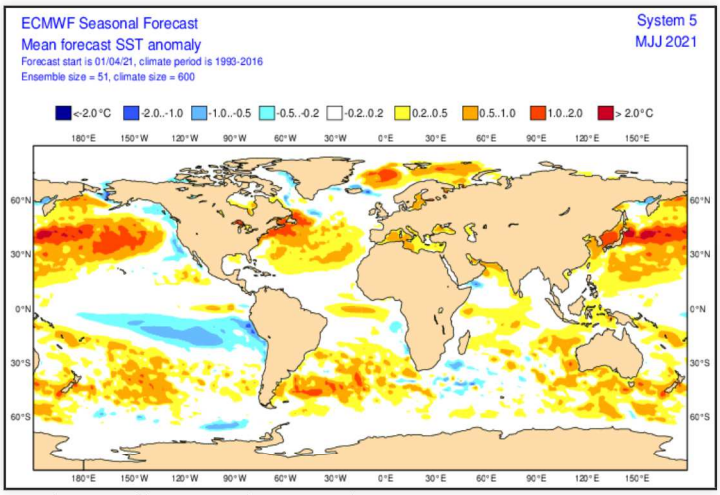
Good SST anomaly forecast in tropical areas. The extension of the warm anomaly along equatorial Atlantic which was too limited in the models.

At mid-latitudes, the main patterns were well forecasted.







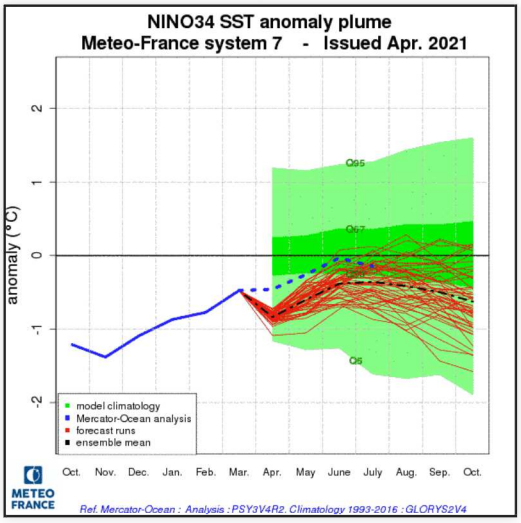


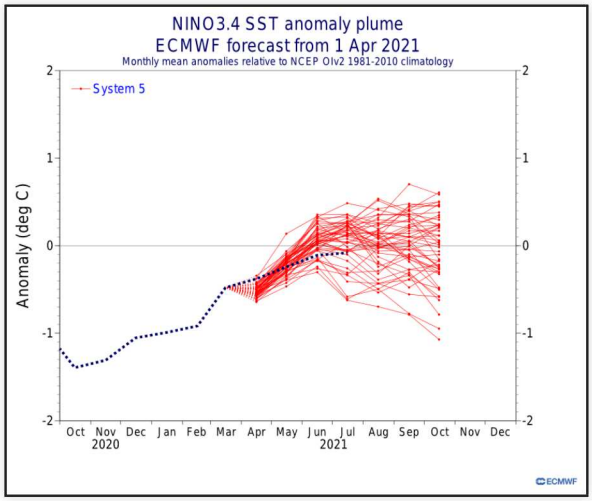
SST anomalies in the analysis from Mercator (top left), C3S multi-models (top right), MF-S7 (bottom left) and SEAS5 (bottom right)

Oceans : ENSO

CAUTION : reference analyses differ between MF-S7 (Mercator-Ocean 1993-2016) and ECMWF-SEAS5 (NCEP 1981-2010).

MF-S7 forecast was too cold the 1st months of simulations (mean error close to 0.5°C), but the trend was correct. ECMWF-SEAS5 forecast was too warm.

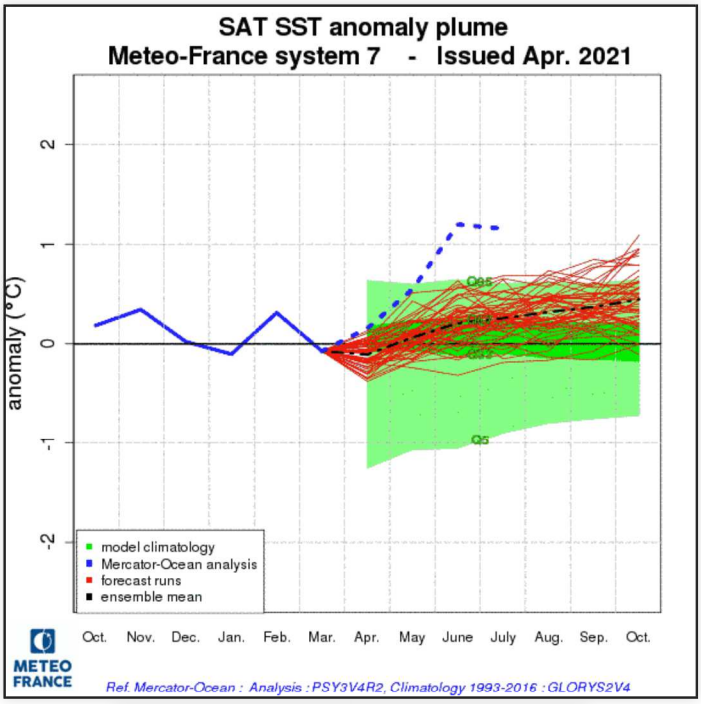


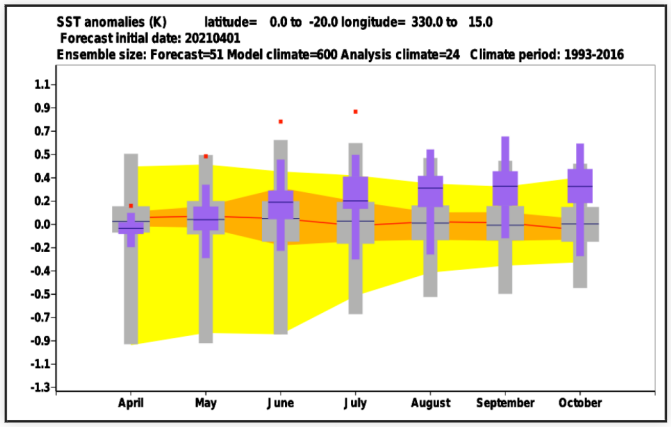


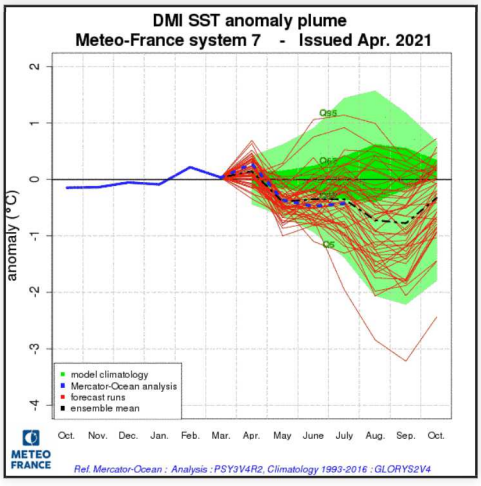
Oceans : tropical Atlantic and Indian Ocean index

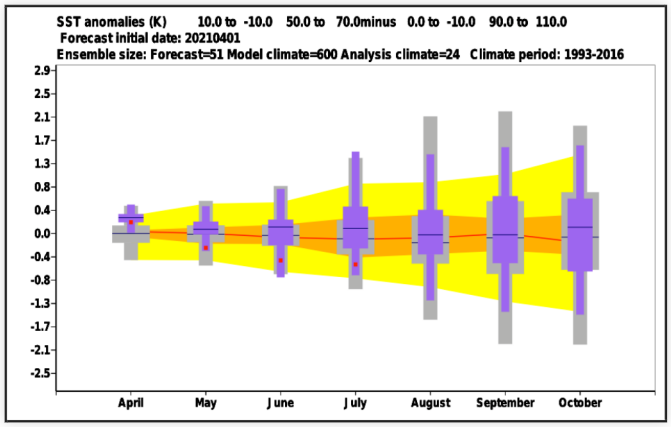
SAT : the positive trend was correctly forecasted, but the magnitude of the anomaly was underestimated (not any run to predict such an extreme event).

DMI : excellent forecast from MF-S7 (its median correspond to observation) , ECMWF-SEAS5 didn't give the indication of the negative trend (large spread forecast, obs. in the spread)





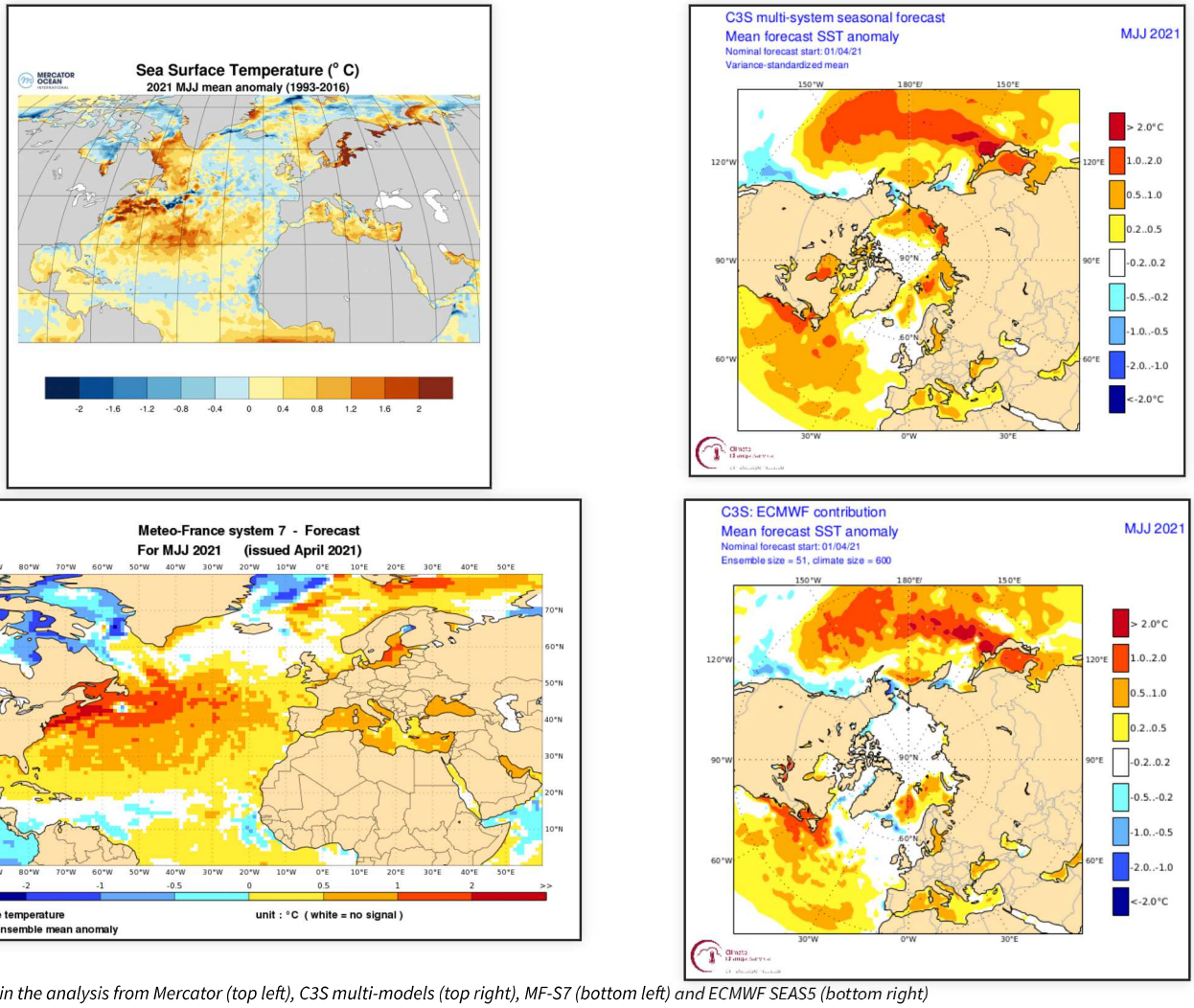




Oceans : North Atlantic SST

The strong positive anomaly in the western part of the Ocean (close to North America) is correct, as well as the warm anomaly extending from Florida to Spain.

The negative anomaly pattern between Greenland and Ireland underestimated.

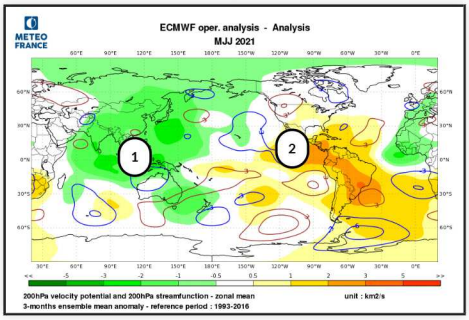


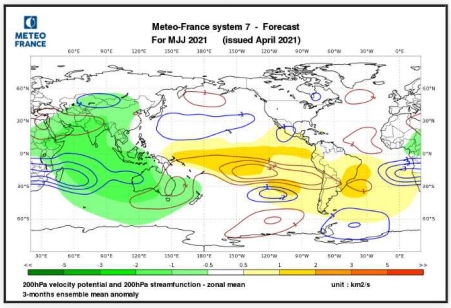
SST anomalies in the analysis from Mercator (top left), C3S multi-models (top right), MF-S7 (bottom left) and ECMWF SEAS5 (bottom right)

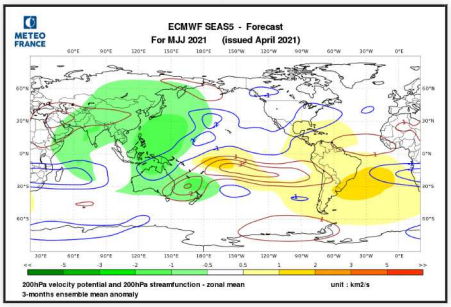
Atmospheric circulation : Global teleconnection

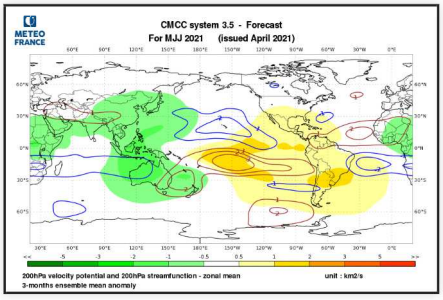
VP : The upward anomaly centred over the Maritime Continent, associated to La Niña, was globally well predicted. The downward anomaly over East Pacific and Central to South America was also rather well predicted. The MJO, very active during the period, probably influenced VP anomaly field.

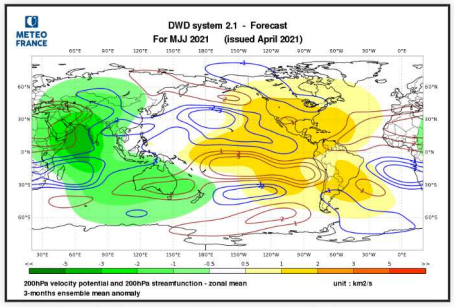
SF : no organised pattern of SF anomaly.











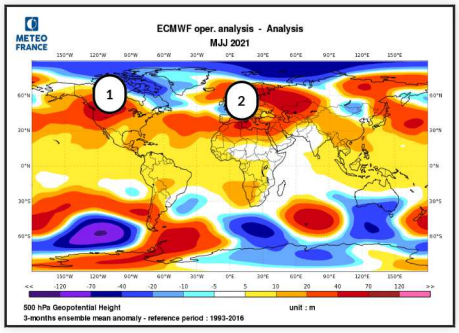
ECMWF analysis, MF-S7, ECMWF-SEAS5, CMCC, DWD and JMA 200hPa velocity potential anomalies (color range, green : ascending, orange: subsidence) and stream function anomalies (isolines, red: anticyclonic in the northern hemisphere, blue: cyclonic in the northern hemisphere).

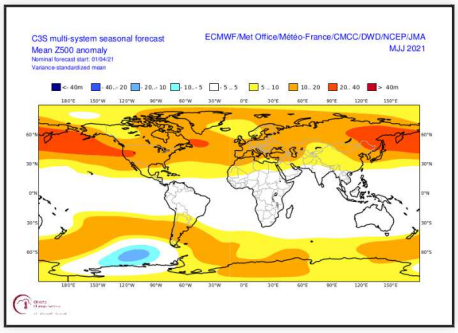
1 - upward motion anomaly, response to La Niña
2 - Main downward anomaly

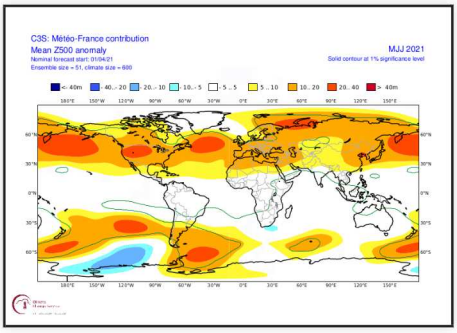
Atmospheric circulation : 500hPa Geopotential height

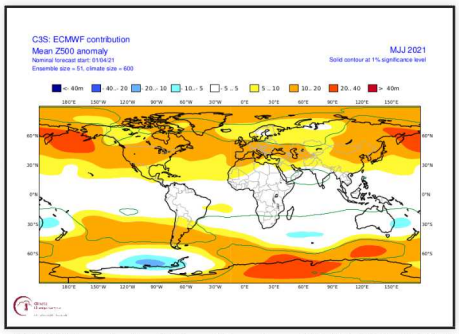
The PNA- pattern is forecasted by all the models but analysis is shited eastward

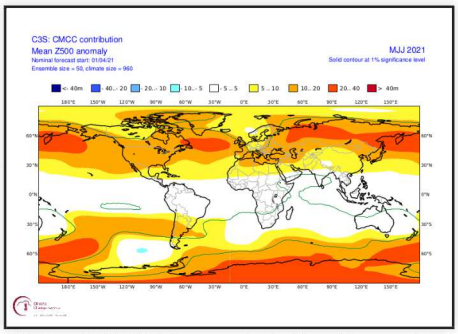
On the North Atlantic and Europe, the anomaly patterns seem to be shifted in latitude.

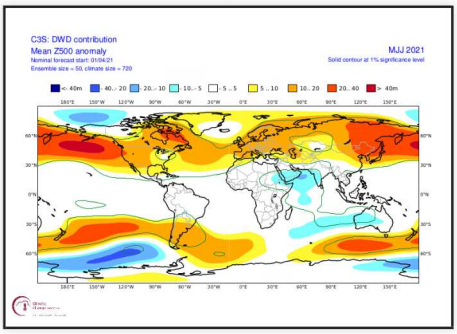










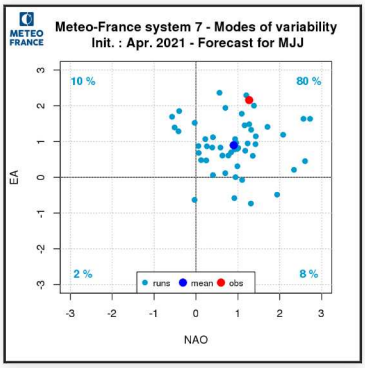


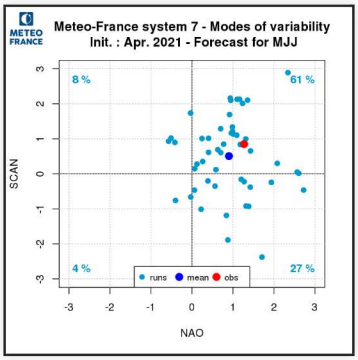
ECMWF analysis, C3S multi-system, MF-S7, ECMWF-SEAS5, CMCC and DWD 500hPa geopotential height anomalies.

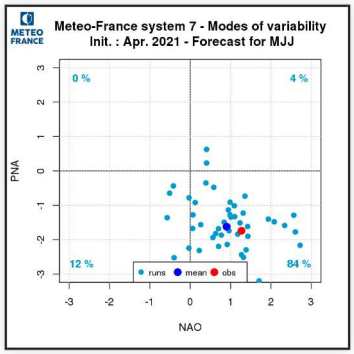
1 - Look like PNA- shift eastward
2 - unexpected negative anomaly

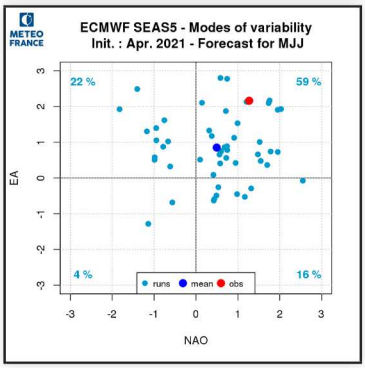
Atmospheric circulation : Modes of variability

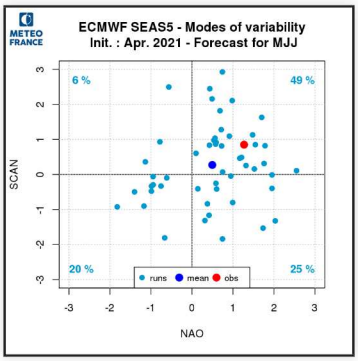
The signs of the modes of variability were correctly forecasted.

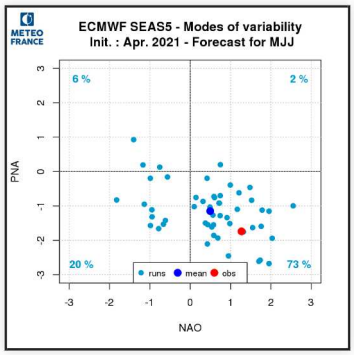






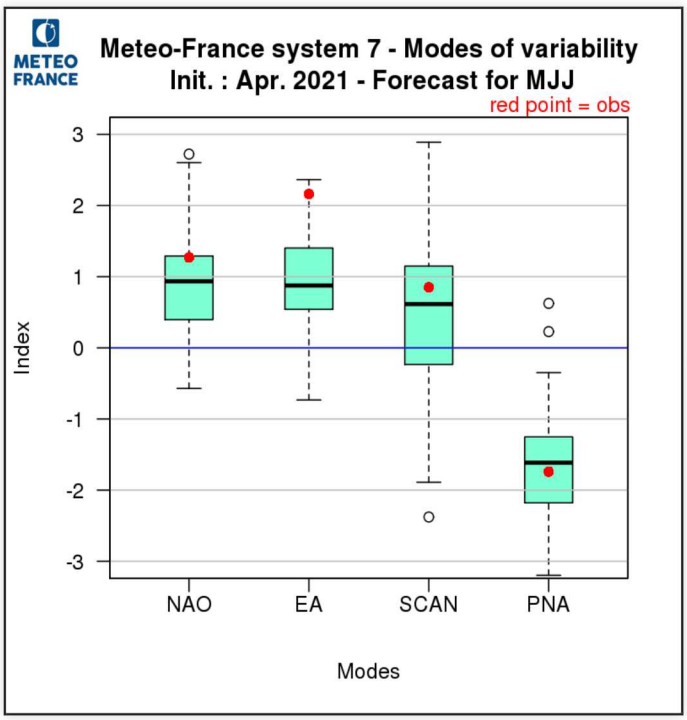


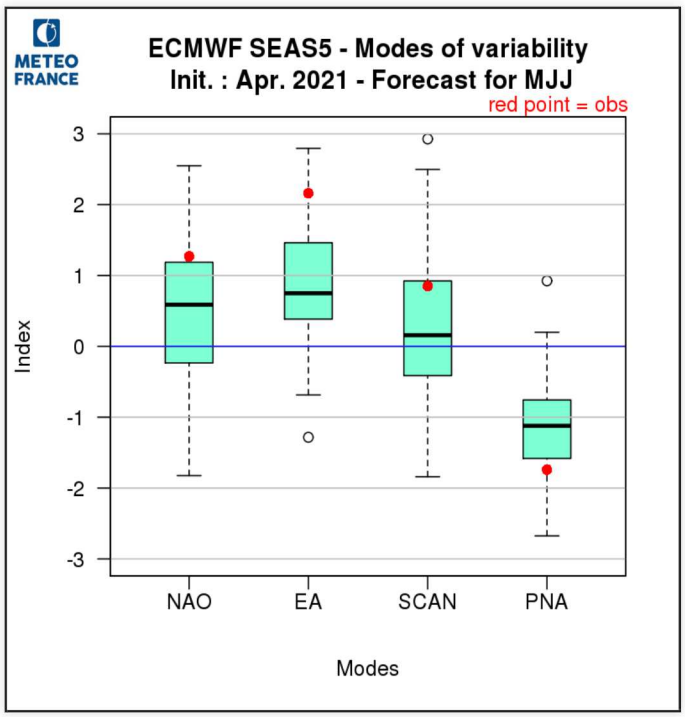




Atmospheric circulation : Modes verification

Same observation as for the previous slide

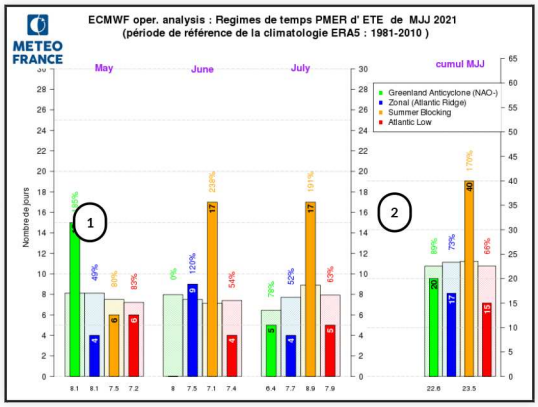


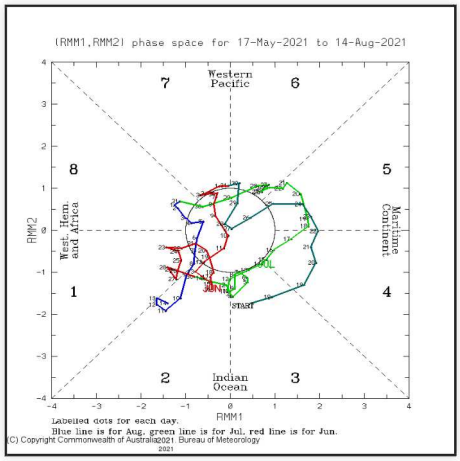


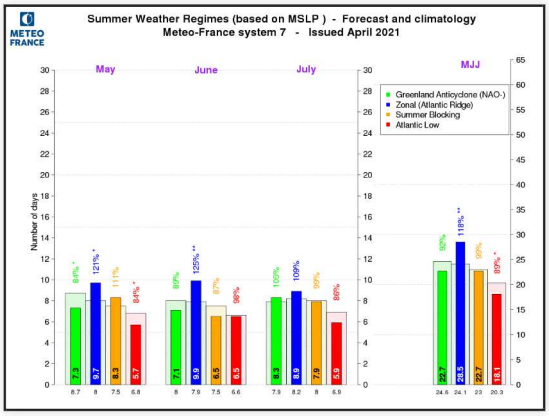
Atmospheric circulation : Summer SLP weather regimes

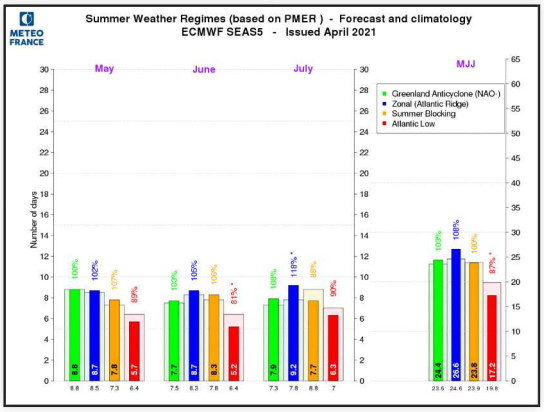
In the quarterly analysis, the SUmmer Blocking is much more frequent than normal.

This was not anticipated by models.









weather regime : ECMWF analysis top left, MF7 and ECMWF forecasts at the bottom. MJO phase top right

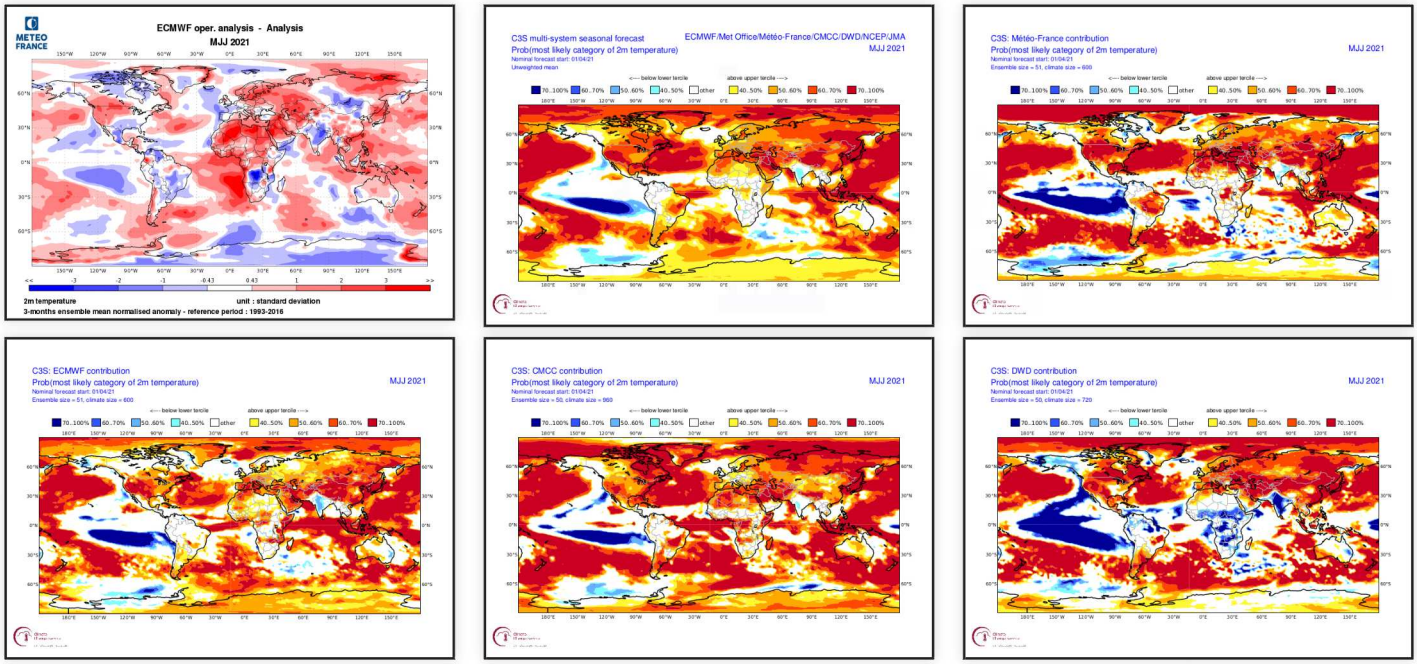
1 - very strong predominance of the zonal regime in September
2 - Predominance of zonal regime last quarter

Climatic parameters : temperature on the globe

The cold anomalies over North America (Canada, North of Gulf of Mexico) and South America, Western Europe, Central Asia and South of Africa were not predicted.

The only region were the models were predicting colder than normal conditions was Indian, it was a good forecast.

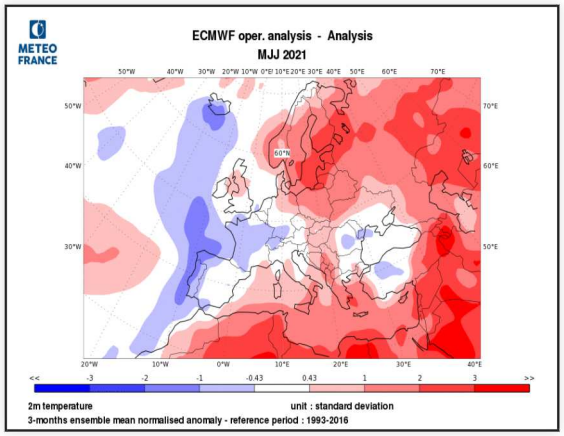
The main warm anomalies (North West of USA, North of Africa, Middle East) were correctly predicted.

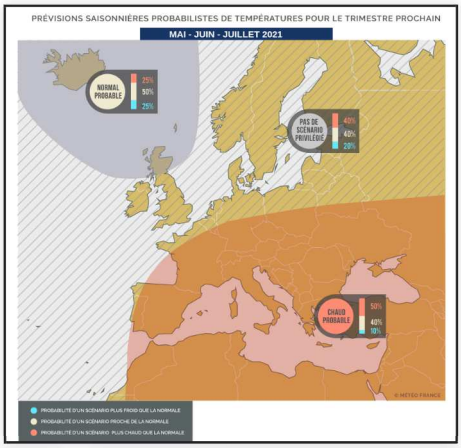


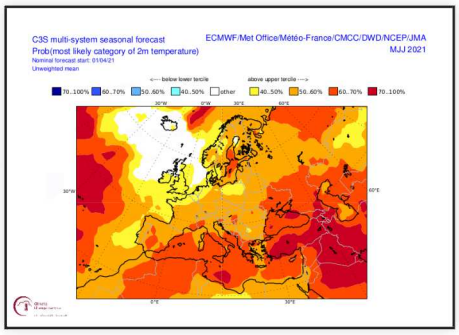
ECMWF analysis top left, forecast for multi-model top center and forecast for MF-S7 top right, ECMWF-SEAS5, CMCC, DWD on the bottom line.

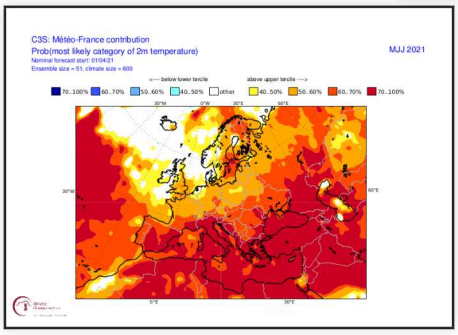
Climatic parameters : temperature over Europe

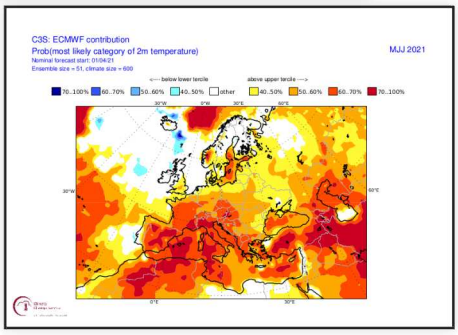
The cold conditions over Western Europe and around the Black Sea were not anticipated by models.









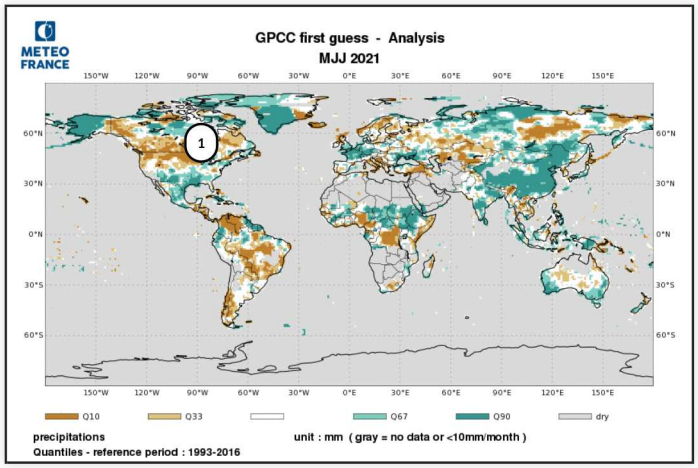


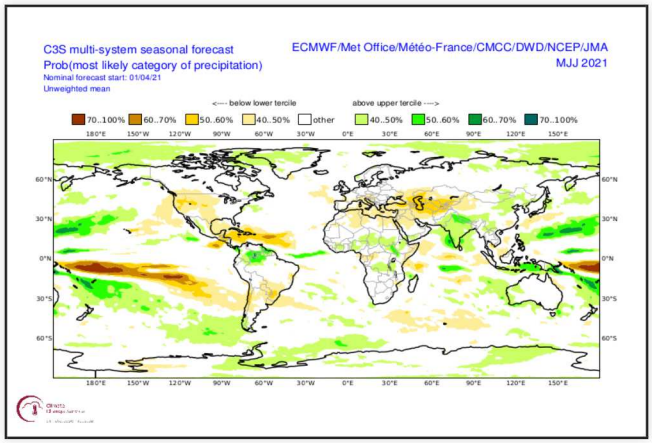
ECMWF analysis top left, synthetic forecast map top right. Forecast for multi-system , MF-S7 and SEAS5 on the bottom line.

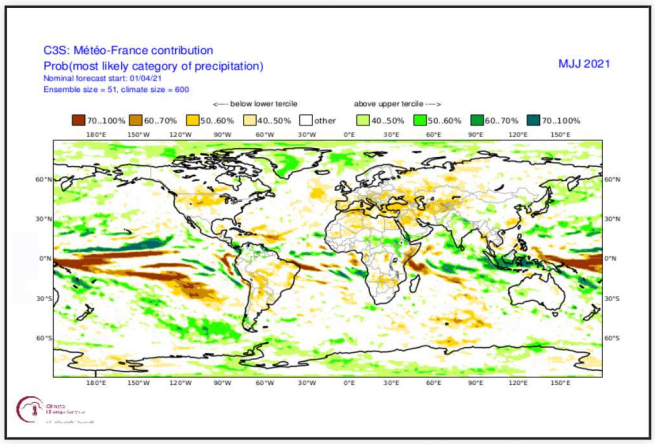
Climatic parameters : Precipitations over the globe

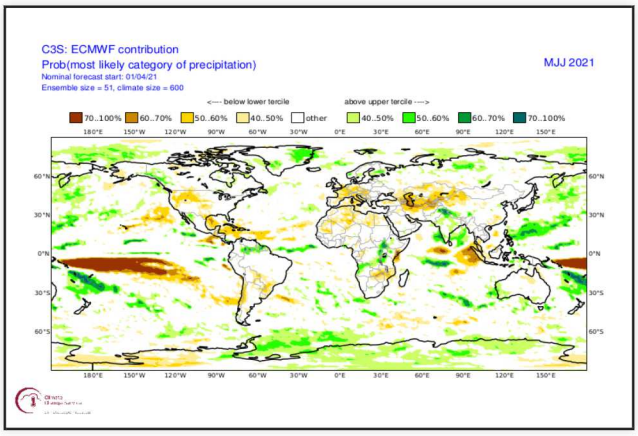
The patterns forecasted by models were correct almost everywhere.

However, mainy area with strong observed anomalies were not forecasted : for instance Western Europe or Alaska







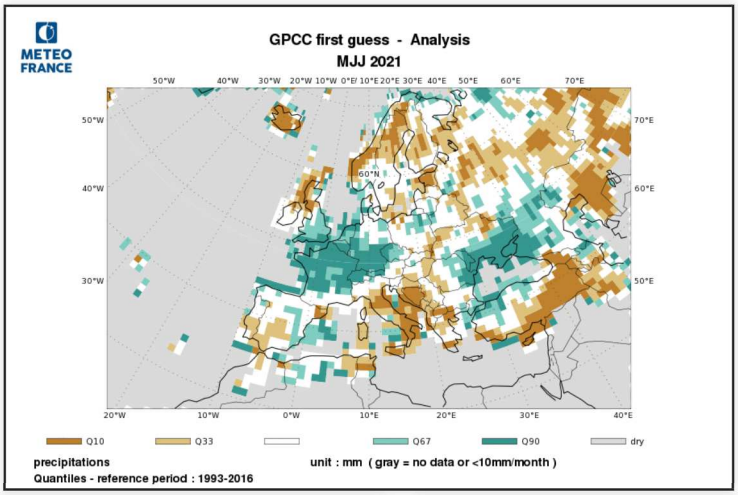


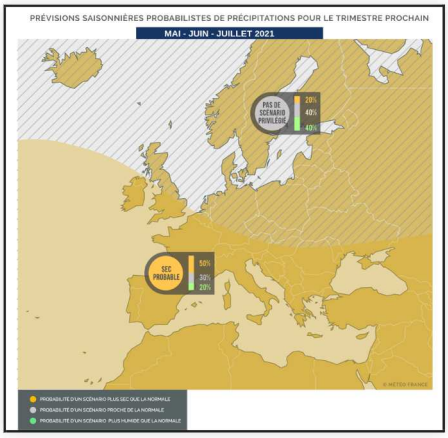
Standardized Precipitation Index analysed by IRI top left, forecast for multi-model top right and MF-S7 and SEAS5 on the bottom line.

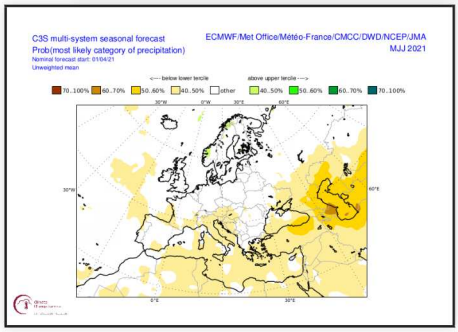
1 - Unusual precipitation forecast for a La Niña situation, due too a shift in the main circulation patterns.

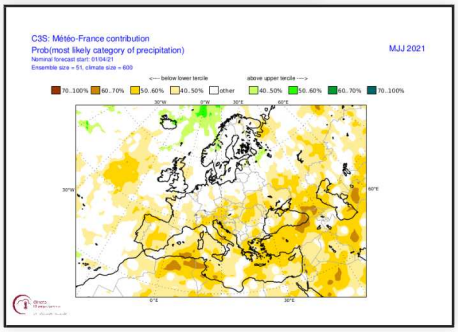
Climatic parameters : Precipitations over Europe

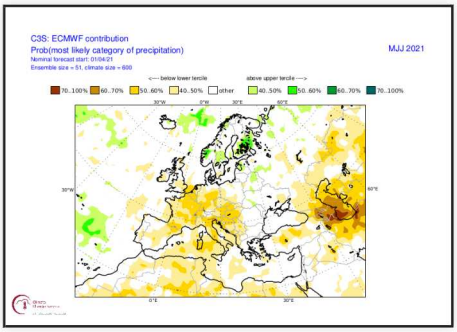
No anticipation of the strong wet signal over Western Europe, neither of the dry signal over Scandinavia.











Precipitation anomalies analysed by IRI (top left). Synthetic forecast map for precipitation (top right) and forecast for multi-model,MF-S7 and SEAS5 (on the bottom line).

General summary : for the period AMJ 2021

1) **Oceans :**

The main patterns were well predicted by models. Correct forecast of ENSO evolution. The warming in the tropical South Atlantic was anticipated, even if its intensity was underestimated.

2) **Large scale atmospheric circulation :**

VP 200 hPa : the main patterns are correct, the differnces probably due to perturbations caused by the active MJO.

SF 200 hPa : very "flat" 3-month oberved field, due to a strong intra-seasonal vairavility (see see monthly analysis of PV/FC 200 hPa)

Z500 : The main anomaly pattern around Europe were not well forecasted. The 3-month negative anomaly centred over France was linked to a succession of troughs in June and July. This kind of situation may be simulated by some runs but is not expected to be visible in ensemble means or multi-model means.

3) **Climatic parameters over Europe :**

Temperatures and Precipitations : Poor forecast over Western Europe